

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

ASSEL, M.

Appl. No. 09/700,788

Group Art Unit: 3682

Filed: February 27, 2001

Examiner: KIM

Title: SHIFT MECHANISM FOR A BICYCLE GEAR ASSEMBLY

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AMENDMENT AND REQUEST FOR RECONSIDERATION

September 4, 2002

Honorable Commissioner of Patents and Trademarks

Washington, DC 20231

Sir:

In response to the Official Action mailed June 4, 2002, please enter the following amendments in the above referenced application and reconsider the application in amended form.

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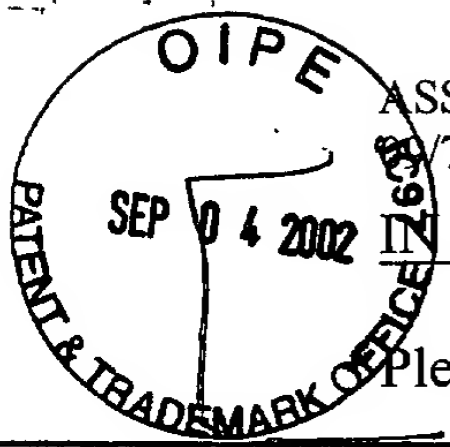
IN THE SPECIFICATION:

Applicant has attached hereto a "marked-up" copy of the original specification as well as a "clean" copy of the revised specification.

Please add the following abstract:

Abstract

A shift mechanism for a bicycle gear assembly that includes an actuating part that may be moved by an actuating lever or a release lever to shift between the gears of the gear assembly. The actuating and release levers operate independently from each other. The actuating part has a winding groove for receiving a cable connected to the gear assembly and first and second toothed segments. The release lever controls a detent element having first and second detent noses that are alternately engageable with the first and second toothed segments, respectively. The release lever may also have a cam contour that allows at least two gears to be shifted upon actuation of the release lever.



ASSEL  
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IN THE CLAIMS

Please amend claims 1-16 as follows:

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1. A shift mechanism for a bicycle gear assembly, comprising:

a housing having an axis;

an actuating lever rotatable about the axis;

an actuating part rotatable about the axis and having a winding groove for receiving a tension cable, the actuating part having a tothing;

a pawl engageable with the tothing on the actuating part to wind up the tension cable;

first and second toothed segments connected to the actuating part;

a detent element having a first detent nose and a second detent nose, the first detent nose engageable with the first toothed segment and the second detent nose engageable with the second toothed segment such that when one of the first and second detent noses is disengaged from the toothed segment, the actuating part is turned by tensile force of the tension cable; and

a release lever operatively connected to the detent element for controlling the detent element.

2. The shift mechanism as claimed in claim 1, wherein the detent element is pivotably mounted on a pivot fixed in relation to the housing and substantially perpendicular to the axis.

3. The shift mechanism as claimed in claim 2, wherein the pivot is located a distance from the axis that substantially equals radii of the first and second toothed segments.

4. The shift mechanism as claimed in claim 2, wherein the pivot is approximately centrally located between the first toothed segment and the second toothed segment.

5. The shift mechanism as claimed in claim 1, wherein the detent element is spring-loaded relative to the housing toward engagement with the second toothed segment.

6. The shift mechanism as claimed in claim 1, wherein the first toothed segment is rotationally connected to the actuating part by a first detent disk, and the second toothed segment is rotationally connected to the actuating part by a second detent risk.

7. A shift mechanism for a bicycle gear assembly, comprising:

a housing having an axis;

an actuating lever rotatable about the axis;

an actuating part disposed in the housing and rotatable about the axis, the actuating part having tothing and a winding groove for receiving a tension cable;

a pawl engageable with tothing on the actuating part to wind up the tension cable;

first and second toothed segments are connected to the actuating part;

a detent element engageable with the first and second toothed segment; and

a release lever operatively connected to the detent element, the release lever having a cam contour having at least one rising cam part and one falling cam part to allow at least two gear ratios to be shifted upon actuating the release lever, while the detent element engages the cam contour.

8. The shift mechanism as claimed in claim 7, wherein the detent element includes a first detent nose engageable with the first toothed segment and a second detent nose engageable with the second toothed segment, and engages the release lever such that, when the release lever is actuated, the detent element performs a rocking motion, during which, in succession, a first detent nose, on the one hand, comes into engagement with the first toothed segment, and a second detent nose, on the other hand, comes into engagement with the second toothed segment.

9. The shift mechanism as claimed in claim 7, wherein the detent element has an edge that engages the cam contour on the release lever.

10. The shift mechanism as claimed in claim 9, wherein the edge is part of an extension on the detent element.

11. The shift mechanism as claimed in claim 7, wherein the release lever is designed as a trigger lever that returns to a rest position (N) through the restoring force of a spring after each actuation.

12. The shift mechanism as claimed in claim 1, wherein the pawl is pivotably mounted on the actuating lever for engaging the tothing connected to the actuating part.

13. The shift mechanism as claimed in claim 12, wherein the first toothed segment is rotationally connected to the actuating part by a first detent disk, and the second toothed segment is rotationally connected to the actuating part by a second detent disk and the tothing is connected to one of the first and second detent disks.

14. The shift mechanism as claimed in claim 13, wherein the tothing is integrally connected to the second detent disk.

15. The shift mechanism as claimed in claim 12, wherein the pawl is out of engagement with the tothing in the rest position of the actuating lever.

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16. A shift mechanism for a bicycle gear assembly, comprising:

a housing having an axis;

an actuating lever rotatable about the axis;

an actuating part rotatable about the axis, the actuating part having tothing and a winding groove for receiving a tension cable, the actuating lever controlling the actuating part;

a pawl engageable with tothing on the actuating part to wind up the tension cable;

first and second toothed segments connected to the actuating part; and

a release lever alternately engageable with the first toothed segment and the second toothed segment,

the actuating lever having, relative to the actuating part, at least one stop engageable with a stop extension when a first or a last gear ratio is reached, thereby distinguishing the rest position (I) of the actuating lever in the first gear ratio and/or the rest position (II) of the actuating lever in the last gear ratio from the normal rest position (N) of the actuating lever in the remaining gear ratios.

Remarks

The Examiner is thanked for the Office Action dated June 4, 2002. This amendment and request for reconsideration is intended to be fully responsive thereto.

The disclosure was objected to because of informalities such as lack of the proper heading arrangement and reference to claim 1 on page 1, line 3. The application has been amended to correct these defects. No new matter has been added.

Applicant has added an Abstract added to satisfy the requirement as set forth in 37 CFR 1.72(b). No new matter has been added.

Claims 1-16 were rejected under 35 USC § 112, second paragraph, for containing indefinite words and phrases making the claims unclear. Claims 1-16 have been amended and are now believed to be in conformance with 35 USC § 112.

It is respectfully submitted that claims 1-16 define the invention and are in condition for allowance and notice to that effect is earnestly solicited.

Should the Examiner believe further discussion regarding the above claim language would expedite prosecution they are invited to contact the undersigned at the number listed below.

Dated: 9/4/02

Respectfully Submitted,



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09/700,788

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Filed: February 27, 2001



Group Art Unit: 3682

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Title: SHIFT MECHANISM FOR A BICYCLE GEAR ASSEMBLY

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APPENDIX OF AMENDMENTS

In the Specification:

Please add the following abstract:

Abstract

A shift mechanism for a bicycle gear assembly that includes an actuating part that may be moved by an actuating lever or a release lever to shift between the gears of the gear assembly. The actuating and release levers operate independently from each other. The actuating part has a winding groove for receiving a cable connected to the gear assembly and first and second toothed segments. The release lever controls a detent element having first and second detent noses that are alternately engageable with the first and second toothed segments, respectively. The release lever may also have a cam contour that allows at least two gears to be shifted upon actuation of the release lever.

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**In the claims:**

1. (Amended) A shift mechanism for a bicycle gear[s] assembly, comprising:

a housing having an axis;

an actuating lever [(1) that is arranged in such a way that it can rotate] rotatable about [a] the [central] axis; [(11) fixed in relation to the housing (2) and is intended for control of an actuating part (3), which is arranged in the housing (2), likewise in such a way that it can rotate]

an actuating part rotatable about the [central] axis [(11), and has] and having a winding groove [(4)] for receiving a tension cable [(5),], the actuating part having a toothing;

a pawl [(6) interacting] engageable with the toothing [(7)] on the actuating part [(3)] to wind up the tension cable; [(5), further comprising]

[a release and retaining mechanism, comprising] [a] first [toothed segment(8)] and [a] second toothed segments [(9), which are] connected to the actuating part [(3), and];

[a release lever (10), which interacts alternately with the first toothed segment (8) and the second toothed segment (9), characterized in that arranged pivotably in the housing (2) there is]

a detent element [(12) that can be moved by the release lever (10) and has] having a first detent nose [(13)] and a second detent nose [(14)], the first detent nose [(13) interacting] engageable with the first toothed segment [(8)] and the second detent nose [(14) interacting] engageable with the second toothed segment [(9),] such that [the actuating part (3) thereby being turned by a tensile force, applied by the tension cable

(5),] when one of the [two] first and second detent noses [(13, 14)] is disengaged from the toothed segment [(8,9)], the actuating part is turned by tensile force of the tension cable;  
and

a release lever operatively connected to the detent element for controlling the  
detent element.

2. (Amended) The shift mechanism as claimed in claim 1, [characterized in that] wherein the detent element [(12)] is pivotably mounted [pivotably] on a pivot [(15)] that is arranged in a manner] fixed in relation to the housing and [essentially] substantially perpendicular to the [central] axis [(11)].

3. (Amended) The shift mechanism as claimed in claim [1 or] 2, [characterized in that] wherein the pivot [(15)] is [at] located a distance from the [central] axis [(11)] corresponding essentially to the] that substantially equals radii of the first and second toothed segments [(8,9)].

4. (Amended) The shift mechanism as claimed in [one of] claim[s 1 to 3] 2, [characterized in that] wherein the pivot [(15)] is [arranged] approximately centrally located between the first toothed segment [(8)] and the second toothed segment [(9)].

5. (Amended) The shift mechanism as claimed in [one of] claim[s] 1[ to 4], [characterized in that] wherein the detent element [(12)] is spring-loaded relative to the housing [(2) in the direction of] toward engagement [of] with the second [detent nose (14)] toothed segment.

6. (Amended) The shift mechanism as claimed in [one of] claim[s] 1 [to 5],  
[characterized in that] wherein the first toothed segment [(8)] is rotationally connected to  
the actuating part [(3)] by a first detent disk [(16)], and the second toothed segment [(9)]  
is rotationally connected [rotationally] to the actuating part [(3)] by a second detent risk  
[(17)].

7. (Amended) A shift mechanism for a bicycle gear[s] assembly, comprising:

a housing having an axis;

an actuating lever [(1)] that is arranged in such a way that it can rotate] rotatable  
about [a central] the axis; [(11) fixed in relation to the housing and is intended for control  
of]

an actuating part [(3), which is arranged in the housing (2), likewise in such a way  
that it can rotate about the central axis (11),] disposed in the housing and rotatable about  
the axis, the actuating part [has] having tothing and a winding groove [(4)] for receiving  
a tension cable[(5)];

a pawl [(6) interacting] engageable with tothing [(7)] on the actuating part [(3)]  
to wind up the tension cable; [(5), further comprising a release and retaining mechanism,  
comprising a]

first [toothed segment (8)] and [a] second toothed segments [(9), which] are  
connected to the actuating part [(3), and];

[a release lever (10), which interacts alternately with the first toothed segment (8)  
and the second toothed segment (9), characterized in that, for actuation of the release and  
retaining mechanism by means of]

a detent element [(12),] engageable with the first and second toothed segment;  
and

[the] a release lever [(10) has] operatively connected to the detent element, the  
release lever having a cam contour [(19) that comprises] having at least one rising cam  
part [(12)] and one falling cam part [(22), thereby allowing] to allow at least two gear  
ratios to be shifted upon actuating the release lever [(10)], while the detent element [(12)  
interacts with] engages the cam contour [(19)].

8. (Amended) The shift mechanism as claimed in claim 7, [characterized in that] wherein  
the detent element includes a first detent nose engageable with the first toothed segment  
and a second detent nose engageable with the second toothed segment, and [(12) interacts  
with] engages the release lever [(10) in] such [a way] that, when the release lever [(10)] is  
actuated, the detent element [(12)] performs a rocking motion, during which, in  
succession, a first detent nose [(13)], on the one hand, comes into engagement with the  
first toothed segment [(8)], and a second detent nose [(14)], on the other hand, comes into  
engagement with the second toothed segment [(9)].

9. (Amended) The shift mechanism as claimed in [either of] claim[s] 7 [or 8],  
[characterized in that] wherein the detent element [(12)] has an edge [(18)] that [interacts  
with a] engages the cam contour [(19)] on the release lever [(10)].

10. (Amended) The shift mechanism as claimed in [one of] claim[s] 7 to] 9, [characterized  
in that] wherein the edge [(18)] is part of an extension [(20)] on the detent element [(12)].

11. (Amended) The shift mechanism as claimed in [one of] claim[s] 7 [to 10],  
[characterized in that] wherein the release lever [(10)] is designed as a trigger lever that  
returns to a rest position (N) through the restoring force of a spring [(23)] after each  
actuation.

12. (Amended) The shift mechanism as claimed in claim 1, [characterized in that  
arranged pivotably on the actuating lever (1) is a] wherein the pawl [(6) that interacts  
with] is pivotably mounted on the actuating lever for engaging the tothing [(24)]  
connected to the actuating part [(3)].

13. (Amended) The shift mechanism as claimed in claim [1 or] 12, [characterized in that]  
wherein the first toothed segment is rotationally connected to the actuating part by a first  
detent disk, and the second toothed segment is rotationally connected to the actuating part  
by a second detent disk and the tothing [(24)] is connected to one of the [two] first and  
second detent disks [(16, 17)].

14. (Amended) The shift mechanism as claimed in [one of] claim[s] 1, 12 or] 13,  
[characterized in that] wherein the tothing [(24)] is integrally connected [integrally] to  
the second detent disk [(17)].

15. (Amended) The shift mechanism as claimed in [one of] claim[s] 1, 12, [13 or 14,  
characterized in that] wherein the pawl [(6)] is out of engagement with the tothing [(24)]  
in the rest position of the actuating lever [(10)].

16. (Amended) A shift mechanism for a bicycle gear[s] assembly, comprising:

a housing having an axis;

an actuating lever [(1)] that is arranged in such a way that it can rotate about a central] rotatable about the axis; [(11)] fixed in relation to the housing and is intended for control of]

an actuating part [(3)], which is arranged in the housing (2), likewise in such a way that it can rotate] rotatable about the [central] axis, [(11)], and has] the actuating part having tothing and a winding groove [(4)] for receiving a tension cable, [(5)] the actuating lever controlling the actuating part;

a pawl [(6)] interacting] engageable with tothing [(7)] on the actuating part [(3)] to wind up the tension cable; [(5)], further comprising a release and retaining mechanism, comprising a]

first [toothed segment (8)] and [a] second toothed segments [(9)], which are connected to the actuating part [(3), and]; and

a release lever [(10)], which interacts] alternately engageable with the first toothed segment [(8)] and the second toothed segment, [(9)], characterized in that]

the actuating lever [(1)]has] having, relative to the actuating part [(3)], at least one stop [(25, 26), which interacts] engageable with a stop extension [(27)] when [the] a first or a last gear ratio is reached, thereby distinguishing the rest position (I) of the actuating lever [(1)] in the first gear ratio and/or the rest position (II) of the actuating lever [(1)] in the last gear ratio from the normal rest position (N) of the actuating lever [(1)] in the remaining gear ratios.



[Description]

## 5

EP 0 352 733 B1 [has] disclose[d]s a shift mechanism for a bicycle gear[s] assembly [in which the object is to create an improved shift mechanism, the mechanism being] that is a trigger shift mechanism, in which the tension cable can be wound up against the spring of the bicycle gear and released by a detent mechanism through the actuation of a single lever. This [object] is achieved [with] by an actuating lever [which is] rotatably mounted [in such a way that it can rotate] about a central axis to tension the tension cable[,]. [o]One detent device is traversed per shift step. [being traversed from gear ratio to gear ratio and this being capable of being relieved by means of a] A release lever is actuated to cause [in such a way that] the actuating lever [is] to be pulled back by the tension cable into the next detent stage for the next gear ratio. The release lever is an integral part of the actuating lever[,]. [t]The release lever being operated in a plane perpendicular to the plane of operation of the actuating lever. The pivot for the release lever is integrated into the actuating lever and, as the individual gear ratios are selected, corotates about the central axis of the actuating lever[,].

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## Summary of the Invention

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by the release lever.[,] [t]The release lever [having  
 arranged in it] has a cam contour connected to the detent  
 element by means of an extension[,]. [t]The detent  
 element [being able to] engages repeatedly and  
 5 alternately [in] the tothing of the two toothed segments  
 when the release lever is actuated in one direction. The  
 detent element is spring-loaded toward the toothed  
 segment on the actuating lever and [in this way adopts]  
thus the detent element is in its rest position when it  
 10 is engaged [in engagement] with this toothed segment.  
 [If] When the first toothed segment is [then] turned by  
 the actuating lever, the detent element slides over the  
 toothed segment, and the extension of the detent element  
 is released from the cam contour of the release lever  
 15 without performing an action.

A tension cable, which is wound up by the rotation  
 of the toothed segment by means of the actuating lever,  
 changes gear ratios in the bicycle gear and  
 20 simultaneously tensions the cable against a spring in the  
 bicycle gear. This tensioning can take place from the  
 first to the last gear ratio. The release lever relaxes  
 the cable and the toothed segments are moved back tooth  
 by tooth, [and] gear ratio by gear ratio. During this  
 25 process, the release lever's cam contour, which comprises  
 a rising cam part and a falling cam part, first [of all]  
 moves the detent element into a position of engagement  
 and then out of a position of engagement with the toothed  
 segment. If the release lever is released, the extension  
 30 on the detent element moves backward over the cam contour  
 and a second gear change is performed. [It appears  
 appropriate to extend the] The cam contour may be  
 extended [as regards its cam parts and] to provide a  
 plurality of rising and falling cam parts. This means

that a plurality of gears can be shifted in a forward movement of the release lever, an equal number of gear change operations being added during the return of the release lever. Since the actuating lever is connected to the first toothed segment by a pawl, the actuating part is moved by the actuation of the release lever, this movement by the pawl being decoupled from the actuating lever.

It is therefore the object of the invention to create a shift mechanism for actuating a bicycle gear assembly which is designed as a trigger shift mechanism and can actuate a cable to shift one or more gear ratios not just in a direction of rotation corresponding to the winding up of the cable but can also shift via at least one but also via a plurality of gear ratios in a direction of rotation corresponding to the unwinding of the cable through the release of the cable.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

The solution is described in the characterizing part of the main claim and in the subclaims. A shift mechanism having the features described in the statement of the object will be explained with reference to a number of drawings, in which:

Fig. 1 shows a shift mechanism for a bicycle, having a housing, an actuating lever and a release lever, and a detent element actuated by the release lever;

Fig. 2 shows the shift mechanism, having an actuating part and two toothed segments, into which the detent element actuated by the release lever engages;

5        Fig. 4 shows the cam contour in the release lever  
with a plurality of rising and falling cam parts; and

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## DETAILED DESCRIPTION OF THE INVENTION

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onto the winding groove 4, and thereby tensioning the spring and changing gear ratios in the bicycle gear assembly.

5 Fig. 2 shows a play-free trigger device in the form of a detent element 12 [with] having a first detent nose 13 and a second detent nose 14[,]. The detent element 12 [which] is arranged pivotably on a pivot 15 fixed in relation to the housing[, it being ensured that the  
10 intersection of] [t]The first detent nose 13 engages [with] the first toothed segment 8 and [that of] the second detent nose 14 engages [with] the second toothed segment 9 [can take place] alternatively. The detent element 12 is supported against the housing by a spring  
15 23 and interacts by means of the second detent nose 14 with the second toothed segment 9 of the second detent disk 17 in the state of rest, thereby ensuring that, once a gear ratio has been selected in the bicycle gear assembly, it is retained. The detent element 12 has an  
20 extension 20 that interacts with a cam contour 19 in the release lever 10. The extension 20 is held in continuous contact with an edge 18 by the spring 23 and, when the release lever 10 is actuated, the extension 20 slides on [this] the cam contour 19, resulting in the detent  
25 element 12 [having imposed on it] performing a rocking motion [that ensures that] causing the second detent nose 14 and the first detent nose 13 to alternately [enter into engagement with] engage the second toothed segment 9 and the first toothed segment 8, respectively.

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[From] Referring to Figs. 3 and 4, [it can be seen that] the cam contour 19 has at least one rising cam part 21 and one falling cam part 22, along which the extension 20 must slide. To [effect] release [of] the cable 5 [for

In [the manner of] trigger shift mechanisms, all the levers return to their starting position through spring force once shifting of the gear ratios in the bicycle gear has been completed, which means that the release lever 10 shown in Fig. 3 can shift a maximum of two gear ratios with its cam contour 19 in the direction of rotation corresponding to the unwinding of the cable. If

only one gear ratio is to be shifted, it is sufficient to turn the release lever 10 merely through a partial angle W until the extension 20 has reached the end of the rising cam part. If the release lever 10 is then released, it returns to its starting position, and the extension 20 returns to its original position. Since, in accordance with Fig. 4, the cam contour 19 has four partial angles W, i.e. two rising cam parts 21 and two falling cam parts 22, it is possible to shift a maximum of 4 gears if the release lever 10 is turned until the extension 20 has traversed all cam parts 21 and 22 in both directions. To make it easier to shift the gear ratios in the bicycle gear assembly, a detent can be built into the release lever 10, making it easier for the rider to find the individual end points for the travel of the release lever 10 for the planned gear ratios.

Fig. 5 shows an actuating lever 1, which, in the position indicated, occupies a rest position N as long as the first and last gear ratios of the bicycle gear are not selected. Arranged on the second detent disk 17 or actuating part 3 is a stop extension 27, which interacts with a first stop 25 and a second stop 26 on the actuating lever 1 when the first gear ratio or last gear ratio is selected in the bicycle gear. Assuming that the first gear ratio is selected when the stop extension 27 has been turned into the outermost position counter to the direction of rotation, the first stop 26 is designed [in] such [a way] that the actuating lever 1 can no longer return to its rest position N and remains in a rest position I of the first gear ratio. Such a measure indicates to the rider by feel that all the gear ratios have been traversed and that the first gear ratio has been reached. It should likewise be communicated to the

The advantage of [a shift mechanism designed in accordance with] the present invention is that it is possible [to a large extent] to shift through the gear ratios of the bicycle gears both with the actuating lever 1 and with the release lever 10[,]. [t]The detent element 12 of both levers 1 and 10 being decoupled [in] such [a way] that the movements of one lever 1 or 10 are not transmitted to the other lever 1 or 10 [but] while the trigger principle, namely the ability to select individual gear ratios, is maintained and both levers 1, 10[, namely the actuating lever 1 and the release lever 10,] always return to their respective initial positions.

The [proposed design of a shift mechanism] present invention also allows the first and the last gear ratios to occupy rest positions I and II that are different from the normal rest position N in order to indicate the end points of the shift steps to the rider by feel without the need to make visual contact with a gear display.





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OF SPECIFICATION

Shift Mechanism For A Bicycle Gear Assembly

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BACKGROUND OF THE INVENTION

Please  
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on 9/29/02

5 The invention relates to a shift mechanism for a bicycle gear assembly and in particular a shift mechanism that includes an actuating lever and a release lever that operate independently from each other to shift between the gears.

10

EP 0 352 733 B1 discloses a shift mechanism for a bicycle gear assembly that is a trigger shift mechanism, in which the tension cable can be wound up against the spring of the bicycle gear and released by a detent  
15 mechanism through the actuation of a single lever. This is achieved by an actuating lever rotatably mounted about a central axis to tension the tension cable. One detent device is traversed per shift step. A release lever is actuated to cause the actuating lever to be pulled back  
20 by the tension cable into the next detent stage for the next gear ratio. The release lever is an integral part of the actuating lever. The release lever being operated in a plane perpendicular to the plane of operation of the actuating lever. The pivot for the release lever is  
25 integrated into the actuating lever and, as the individual gear ratios are selected, corotates about the central axis of the actuating lever. A drawback associated with this configuration is that in the extreme positions of the shift mechanism, between the hill-  
30 climbing gears and the speed gears, the actuating lever is located in an area which is ergonomically unfavorable.

French Patent FR 2 701 917 (93 02255) discloses a release lever and an actuating lever that are arranged in

two parallel planes of action. This configuration allows an actuating part to be turned by the actuating lever about a common central axis, while the release lever resets the part, gear ratio by gear ratio by means of a  
 5 toothed rocker bar. The manner in which the rocker bar engages the tothing on the actuating part is similar to a toothed rocker bar in a mechanical clock, which is actuated by a balance.

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### Summary of the Invention

This invention combines the features of EP 352 733 with the features of FR 2 701 917 inasmuch as a release lever engages a first toothed segment and a release lever  
 15 acts on a second toothed segment. The release lever and an actuating lever acting in planes that are parallel to one another. The two toothed segments are connected by a detent element designed as a rocker and having detent noses that can alternately engage in one set of tothing  
 20 of the toothed segments or the other. The detent element is controlled by the release lever. The release lever has a cam contour connected to the detent element by means of an extension. The detent element engages repeatedly and alternately the tothing of the two  
 25 toothed segments when the release lever is actuated in one direction. The detent element is spring-loaded toward the toothed segment on the actuating lever and thus the detent element is in its rest position when it is engaged with this toothed segment. When the first  
 30 toothed segment is turned by the actuating lever, the detent element slides over the toothed segment, and the extension of the detent element is released from the cam contour of the release lever without performing an action.

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5 A tension cable, which is wound up by the rotation  
of the toothed segment by means of the actuating lever,  
changes gear ratios in the bicycle gear and  
simultaneously tensions the cable against a spring in the  
bicycle gear. This tensioning can take place from the  
first to the last gear ratio. The release lever relaxes  
the cable and the toothed segments are moved back tooth  
by tooth, gear ratio by gear ratio. During this process,  
10 the release lever's cam contour, which comprises a rising  
cam part and a falling cam part, first moves the detent  
element into a position of engagement and then out of a  
position of engagement with the toothed segment. If the  
release lever is released, the extension on the detent  
15 element moves backward over the cam contour and a second  
gear change is performed. The cam contour may be  
extended to provide a plurality of rising and falling cam  
parts. This means that a plurality of gears can be  
shifted in a forward movement of the release lever, an  
20 equal number of gear change operations being added during  
the return of the release lever. Since the actuating  
lever is connected to the first toothed segment by a  
pawl, the actuating part is moved by the actuation of the  
release lever, this movement by the pawl being decoupled  
25 from the actuating lever.

It is therefore the object of the invention to  
create a shift mechanism for actuating a bicycle gear  
assembly which is designed as a trigger shift mechanism  
30 and can actuate a cable to shift one or more gear ratios  
not just in a direction of rotation corresponding to the  
winding up of the cable but can also shift via at least  
one but also via a plurality of gear ratios in a

direction of rotation corresponding to the unwinding of the cable through the release of the cable.

#### BRIEF DESCRIPTION OF THE DRAWINGS

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The solution is described in the characterizing part of the main claim and in the subclaims. A shift mechanism having the features described in the statement of the object will be explained with reference to a number of drawings, in which:

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Fig. 1 shows a shift mechanism for a bicycle, having a housing, an actuating lever and a release lever, and a detent element actuated by the release lever;

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Fig. 2 shows the shift mechanism, having an actuating part and two toothed segments, into which the detent element actuated by the release lever engages;

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Fig. 3 shows the release lever with a cam contour for the actuation of the detent element;

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Fig. 4 shows the cam contour in the release lever with a plurality of rising and falling cam parts; and

Fig. 5 shows the actuating lever with a pawl that can be operated on the housing side and is intended to interact with tothing on a second detent disk.

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#### DETAILED DESCRIPTION OF THE INVENTION

The invention describes a bicycle gear shift mechanism that can be arranged on bicycle handlebars and controls a bicycle gear assembly. According to Fig. 1,

the shift mechanism includes a housing 2 with an actuating part 3 that can be moved by an actuating lever 1 and by a release lever 10. The actuating part 3 has a winding groove 4 for a tension cable 5, which is connected to the bicycle gear assembly and is kept under tension by a spring located there. The actuating part 3 has a first detent disk 16 with a first toothed segment 8 and a second detent disk 17 with a second toothed segment 9. The actuating part 3 having a configuration such that it can rotate about a central axis 11 with the first detent disk 16 and the second detent disk 17. The actuating part 3 can be turned by the actuating lever 1 by means of a pawl 6, which engages in tothing 7 connected rotationally to the actuating part 3. When the actuating lever 1 is moved, this movement is transmitted to the actuating part 3 by the pawl 6, resulting in the cable 5 being wound onto the winding groove 4, and thereby tensioning the spring and changing gear ratios in the bicycle gear assembly.

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Fig. 2 shows a play-free trigger device in the form of a detent element 12 having a first detent nose 13 and a second detent nose 14. The detent element 12 is arranged pivotably on a pivot 15 fixed in relation to the housing. The first detent nose 13 engages the first toothed segment 8 and the second detent nose 14 engages the second toothed segment 9 alternatively. The detent element 12 is supported against the housing by a spring 23 and interacts by means of the second detent nose 14 with the second toothed segment 9 of the second detent disk 17 in the state of rest, thereby ensuring that, once a gear ratio has been selected in the bicycle gear assembly, it is retained. The detent element 12 has an extension 20 that interacts with a cam contour 19 in the

release lever 10. The extension 20 is held in continuous contact with an edge 18 by the spring 23 and, when the release lever 10 is actuated, the extension 20 slides on the cam contour 19, resulting in the detent element 12 performing a rocking motion causing the second detent nose 14 and the first detent nose 13 to alternately engage the second toothed segment 9 and the first toothed segment 8, respectively.

Referring to Figs. 3 and 4, the cam contour 19 has at least one rising cam part 21 and one falling cam part 22, along which the extension 20 must slide. To release the cable 5 to shift between gear ratios, the release lever 10 is actuated to disengage the retaining connection between the second detent nose 14 and the second toothed segment 9, resulting in the actuating part being turned by the cable in the winding groove 4 which is being pulled back gear ratio by gear ratio by the spring situated on the bicycle gear. In this case, the extension 20 of the detent element 12 runs up onto the rising cam part 21 of the cam contour 19, the release lever 10 has turned through a partial angle  $W$  and the first detent nose 13 has entered into engagement with the first toothed segment 8. When the cable 5 has been released from the winding groove 4 by about half a gear ratio; the second half of the gear ratio is traversed by virtue of the fact that, in accordance with Fig. 3, the extension moves back on the falling cam part 22 into its original position, provided that the release lever 10 is turned by a further partial angle  $W$ .

In trigger shift mechanisms, all the levers return to their starting position through spring force once shifting of the gear ratios in the bicycle gear has been

completed, which means that the release lever 10 shown in Fig. 3 can shift a maximum of two gear ratios with its cam contour 19 in the direction of rotation corresponding to the unwinding of the cable. If only one gear ratio is to be shifted, it is sufficient to turn the release lever 10 merely through a partial angle  $W$  until the extension 20 has reached the end of the rising cam part. If the release lever 10 is then released, it returns to its starting position, and the extension 20 returns to its original position. Since, in accordance with Fig. 4, the cam contour 19 has four partial angles  $W$ , i.e. two rising cam parts 21 and two falling cam parts 22, it is possible to shift a maximum of 4 gears if the release lever 10 is turned until the extension 20 has traversed all cam parts 21 and 22 in both directions. To make it easier to shift the gear ratios in the bicycle gear assembly, a detent can be built into the release lever 10, making it easier for the rider to find the individual end points for the travel of the release lever 10 for the planned gear ratios.

Fig. 5 shows an actuating lever 1, which, in the position indicated, occupies a rest position  $N$  as long as the first and last gear ratios of the bicycle gear are not selected. Arranged on the second detent disk 17 or actuating part 3 is a stop extension 27, which interacts with a first stop 25 and a second stop 26 on the actuating lever 1 when the first gear ratio or last gear ratio is selected in the bicycle gear. Assuming that the first gear ratio is selected when the stop extension 27 has been turned into the outermost position counter to the direction of rotation, the first stop 26 is designed such that the actuating lever 1 can no longer return to its rest position  $N$  and remains in a rest position  $I$  of

the first gear ratio. Such a measure indicates to the rider by feel that all the gear ratios have been traversed and that the first gear ratio has been reached. It should likewise be communicated to the rider by feel  
 5 that shifting further would be pointless through a rest position II of the last gear ratio. This is achieved by virtue of the fact that the stop extension 27 runs clockwise against the first stop 25, thereby preventing the actuating lever 1 from returning to the rest position  
 10 N.

The advantage of the present invention is that it is possible to shift through the gear ratios of the bicycle gears both with the actuating lever 1 and with the  
 15 release lever 10. The detent element 12 of both levers 1 and 10 being decoupled such, that the movements of one lever 1 or 10 are not transmitted to the other lever 1 or 10 while the trigger principle, namely the ability to select individual gear ratios, is maintained and both  
 20 levers 1, 10 always return to their respective initial positions. The present invention also allows the first and the last gear ratios to occupy rest positions I and II that are different from the normal rest position N in order to indicate the end points of the shift steps to  
 25 the rider by feel without the need to make visual contact with a gear display.